SCHOOL OF EDUCATION
LIBRARY

The American Biology Teacher

Vol. 10 MARCH, 1948 No. 3

Genetics and Human Behavior - - - - - - - Oscar Riddle 69

Some Uses of Animal Behavior in The Teaching of General Biology - - - D. F. Miller 75

A Review Field Activity on Plants - Elmo N. Stevenson 78

By The Way - - - - - - - - - 80

Letters - - - - - - - - - - - 80

Books - - - - - - - - - - - 81

Biological Briefs - - - - - - - 82

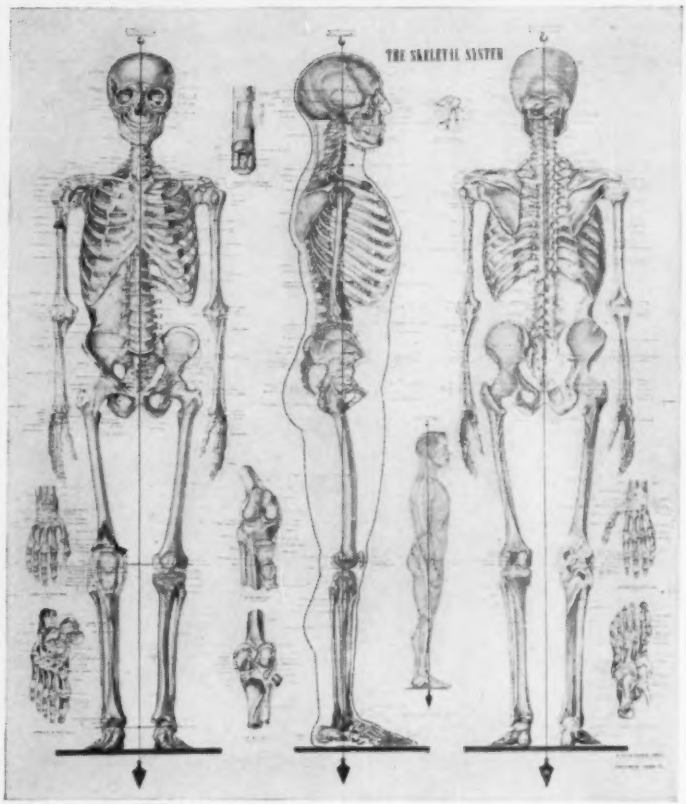
Commercials - - - - - - - - 84

PUBLISHED BY
The National Association of Biology Teachers

Entered as second class matter October 26, 1939, at the post office at Lancaster, Pa., under the Act of March 3, 1879.

The New Peter Bachin ANATOMICAL CHARTS

MUSCULAR • SKELETAL



The illustration (of the skeletal chart) cannot possibly show its beauty and completeness. Lithographed in SIX colors, on heavy antique paper, metal mouldings at top and bottom with eyelets for hanging. They measure 20 by 26 inches.

Sharply detailed engravings satisfy the professional worker and clarifies the subject for the student.

ALL parts are clearly labeled on the charts themselves obviating reference to numerically keyed list of names.

So sure are we that you will be more than pleased with them that we offer full and immediate credit on their return if not entirely satisfied.

No. 92290 Anatomical Chart, Bachin, Muscular $3.95
(2 complete figures, (front and back) and 7 detailed insertions)

No. 92291 Anatomical Chart, Bachin, Skeletal $3.95
(3 complete figures, (front, side and back) 8 detailed insertions)

For advanced students in College, Medical Schools, Hospitals etc., the new LIFE SIZE Bachin Nervous and Vascular Systems Charts are the ONLY life size charts in the world representing the ENTIRE systems, voluntary and involuntary, both sexes, with special detailed insertions, lithographed in *10* colors, completely labeled. 36 by 69 inches. Mounted on cloth, with rollers top and bottom.

No. 92292 Anatomical Chart, Bachin, Nervous System $18.00

No. 92293 Anatomical Chart, Bachin, Vascular System $14.00

Further details on request.

Exclusively in the educational field from

CHICAGO APPARATUS COMPANY

1735 N. Ashland Avenue **Chicago 22, Illinois**

The American Biology Teacher

Vol. 10 MARCH, 1948 No. 3

Genetics And Human Behavior*

OSCAR RIDDLE
Plant City, Florida

When one is asked to discuss a subject about which too little that is definite is known he might just say little that is definite and quit. You, however, can doubtless feel no assurance of such a short and happy ending to this talk. We all know too well that—human behavior being what it is—writing and speaking are arts not limited by precise information.

Though human behavior is a huge and open book, there are now few pages for the volume that would describe the exact role of genetics in that behavior. The reasons for this are several and fairly obvious, but some of them should be mentioned. (1) Environment and genes so share in the development of most behavioral traits that only very special study and analysis can evaluate the specific role of the genes in any trait. (2) The methods used in genetic studies are either difficult to apply to humans or they have been developed only recently. (3) Most items of human behavior are of an order of complexity that renders genetic analysis difficult. (4) Precisely in humans the inevitable social environment, including the traditions and tabus of the tribe, enters as a most potent modifier of behavior. (5) Some of the most valuable—though indirect—information on the genetics of human behavior has been and is being obtained through tests on the higher animals. Data from these sources must of course pass the test for their probable applicability to man.

By the American school of behaviorism we were told that the human infant has a highly plastic mind, and at that age level conditioning—not instinct—is the basis of nearly all behavior. That school overlooked, indeed it denied, the quite important role of genetics in infant and child behavior. Moreover, instincts such as the sexual and parental instincts require a long span of ageing and glandular development for their exhibition; and this, we now know, is in addition to a suitable complement of genes. Since these instincts thus arise also only after considerable periods of education, and

* Presented at the Annual Meeting of the National Association of Biology Teachers, Chicago, December 30, 1947.

after much exposure to the unique human social environment, the study of their role in humans is by no means a simple matter. Such study involves the separation of unlearned behavior (instinct) from large reservoirs of learned behavior and tabu.

An even more general statement could have preceded all that was stated above. The distinction between human behavior and that of our sub-human ancestors certainly rests, primarily, on genetic difference. Again, the thing we ordinarily think of as mind, namely conscious (or self-conscious) awareness, is nowadays regarded as the last thing to occur in a long series of developments; and it is evident that all steps or stages in that series were associated with changes in the population of genes. Moreover, psychology asks us to remember that mind, as defined above, is really but a smaller part of the mind. Conscious awareness represents only that small area of illumination and clarity where, so to speak, the spotlight is thrown on a much larger dome of darkness; in that bright area reside reasoning, judgment, discrimination and perception. Outside of that small area is a spacious region of twilight and darkness in which nothing is clearly seen or outlined. This is, according to White:[1]

> "the region of the emotions, or speaking more generally, the feelings. It is in this zone that our instincts manifest themselves, our intuitions have play, and instead of being governed by intellectual processes it is the region in which instinctive forces, natural desires, the avoidance of pain, the seeking of pleasure, prevail; in short the region where the wish holds sway. . . . (Here) reasoning gives way to phantasies, and things happen because we want them to. . . . Things are true because they are thought to be true, and for no other reason. It is the land of dreams and their realization. It is the region above all in which we live as the other region is that in which we think."

[1] WHITE, W. A. *Jour. Wash. Acad. of Sci.*, Vol. 25 (Jan.), 1935.

And just here we may stress the relevance and importance of the fact that the several instincts which populate this obscure region probably all have a genetic basis. Our present deep ignorance of the number and nature of these particular genes in man is embarrassing but relatively unimportant to the principal theme of this discussion. Finally, it is recognized that those mental functions (reason, etc.) which now occupy the illuminated spot gradually arose as differentiations within the—gene controlled—larger and darker background of instincts and feeling.

Also of general import is the pervasive fact that the mind, or better, the body-mind of *Homo sapiens*, is the climax of developments toward increased accuracy of adjustment. Conscious awareness provided a gigantic stride to such adjustments of the organism. With its aid past experience, choice, delayed response, or response planned for continuance over several years, could then emerge. But conscious awareness also brought along a train of difficulties and undesirable things which profoundly affect human behavior. In this train were such things as anxiety, and fear of personal and family insecurity; these, together with conflicts of functions within the "light" and "dark" areas of man's mentality, gave rise to essentially new mental diseases with much and prolonged abnormal behavior. Foremost in this train of difficulties of adjustment is man's adjustment to other men. Adjustment to life under the sea or in the clouds, or to temperature extremes of the poles and tropics, man has taken in his stride. But no other task has proved so difficult as to adjust to his fellow men. His failure

here is seen on all sides, though most tragically in trails of his own blood which reach back beyond the birth of his species. Our animal ancestry endowed us with incentive and ability to murder and war.

It seems evident that these various failures of mental adjustment in man involve an appreciable share of human behavior, and also that they arise, in part, from his all-too-slight understanding of himself. Those most capable of judging generally agree that man's knowledge of himself is far below his knowledge of the world about him. Most of such opinion further agrees that when these two fields can be comprehended somewhat equally man will have a new capacity for adjustment to his fellows far in excess of anything we have ever imagined. Here we momentarily digress to recall that several sections of THE AMERICAN ASSOCIATION FOR THE ADVANCEMENT OF SCIENCE, and several associated societies—like your own—are now in session dealing with things which will contribute to man's knowledge of himself. I further beg to remark that the knowledge of prime importance for man's better understanding of himself must come from biology, psychology and psychiatry, and that in our nation it is your own NATIONAL ASSOCIATION OF BIOLOGY TEACHERS that has special opportunity and obligation to carry this knowledge to all members of our tribe. (Again, reflecting upon this fine duty and privilege of the NABT, I would—secretly or otherwise—profess much pride in my share in fathering this Association.)

There is another quite substantial way in which human behavior, considered as a means or medium of adaptation, is related to human evolution and to genes. Since his attainment of the human status man has largely escaped from the bondage of the physical and the biological into a new and complex social environment. Thus, adaptation in man probably is and long has been much less to the external and internal evironment than to social factors uniquely associated with man. Recently this view has been ably presented by Dobzhansky and Montagu:[2]

> "It is evident that man by means of his reasoning abilities, by becoming a 'political animal,' has achieved a mastery of the world's varying environments quite unprecedented in the history of organic evolution. The system of genes which has permitted the development of the specifically human mental capacities has thus become the foundation and the paramount influence in all subsequent evolution of the human stock. An animal becomes adapted to its environment by evolving certain genetically determined physical and behavior traits; the adaptation of man consists chiefly in developing his inventiveness, a quality to which his physical heredity predisposes him and which his social heredity provides him with the means of realizing. To the degree to which this is so, man is unique. As far as his physical responses to the world are concerned, he is almost wholly emancipated from dependence upon inherited biological dispositions, uniquely improving upon the latter by the process of learning that which his social heredity (culture) makes available to him. . . . No other species is comparable to man in its capacity to acquire new behavior patterns and discard old ones in consequence of training. Considered socially as well as biologically, man's outstanding capacity is his educability. The survival value of this capacity is manifest, and therefore the possibility of its development through natural selection is evident."

It is further notable that in the whole animal world genetics supplies a basis for the fixity or for the plasticity of behavioral traits. The rigidity of this genetic fixation is well seen in the ants, bees, termites and other insects; the

[2] DOBZHANSKY, TH. and M. F. ASHLEY MONTAGU, *Science*, June 6, 1947.

plasticity of this genetic fixation is most developed in man, where it is associated with a large brain and—as noted above—with the highly effective role of the social environment. Even most so-called instinctive behaviors, or drives, are normally much modified in humans by education, experience, tribal tabu, or by another aspect of the social environment.

In this connection it may be remarked that, among vertebrate species, the genetic difference between the sexes sometimes does and sometimes does not qualify the appearance of parental behavior (or instinct) in the individual. Moreover in some species or races this instinct is exhibited by neither sex; but of course even the complete absence of the instinct in a species is also genetically determined. Some years ago it was found in our own laboratory that, in suitably chosen fowl, injections of the hormone, prolactin, resulted in the establishment of maternal behavior (incubation, clucking, care of young) in hens; but in roosters of the same breed similar treatment evoked no more than an occasional reluctant cluck—the presence of eggs in a nest never commanded respect or attention. In rats, however, both males and females usually responded to the prolactin treatment by obvious parental behavior—nest building, carrying young (rats, mice, squabs) to nest, and cuddling these young. The parental instinct is evidently much older than birds and mammals. In a species of Indian fish (*Avino jella*) the males, and apparently the males only, take the fertilized eggs (each about 10 mm. in diameter) in their mouths and there guard them till the young are hatched. Some instances of the brooding of eggs by amphibians and reptiles are well known. The maternal instinct is presumed to prevail in women. I have not seen whatever literature may exist on the worthy question of the possible modification of this instinct by the social or other environment.

Questions concerning the inheritance of mental traits in individuals and in races remains for consideration. Studies on identical (and on fraternal) twins reared together and apart have provided the best of the available evidence on the relative roles of heredity and of environment in accounting for the variance of several human traits. Collectively these numerous studies approximate a demonstration that both genes and environment share in the development of some kinds of learning ability and temperament as well as in a wide variety of physical traits. Studies on the population in general tend to confirm those results, and further to show that such traits as color blindness, feeblemindedness, ataxia (lack of control of voluntary movements), Huntington's chorea, some gradations of mental ability, and some forms of insanity, are either partly or rigidly controlled by genes.

Studies made on comparable traits in animals have yielded quite similar results, and usually these studies accomplished a far better analysis of the genetics of the trait than was possible in man. We ourselves have observed wildness contributed by a rock pigeon to persist during thirty years in domestic pigeons carrying no more than one-sixteenth of the wild bird's "blood." In another case a mutation producing ataxia—wholly comparable with human ataxia affecting brain and spinal cord—still persists in a strain of our domestic pigeons after thirty-three years. The classic experiments of Cannon thoroughly demonstrated the role of an adrenal hormone in such states as fear and anger—states inseparable from savageness and wildness.

Pavlov's dogs differed perhaps as much in temperament and intelligence

as in physical traits; and in general these were breed differences obviously due to genes. Koehler's chimpanzees, presumably of the same breed, included one or two near-geniuses, along with other individuals described as sulky, cheerful, shy, or bad-tempered.

Attention should now be given, however briefly, to those very important instances, human and animal, in which it is evident that both genes and hormones serve to condition such things as temperament and behavior. Cases of intermediate sexuality in man may in very rare cases clearly rest on genic or chromosomal foundations, though much more frequently we can know only that hormones of the gonads or of the adrenal cortex are involved. Not negligible here is the evidence from animal experiments which indicates that both constitutional (genetic) and environmental factors can influence the output of gonadal (sex) and certain other hormones. Kretschmer made the significant observation that certain kinds of insanity are associated in man with certain kinds of body-build. Still other similar associations of temperament with body-build in normal people are currently under study and description by Sheldon and his associates.[3] These very significant results gain in importance by two additional circumstances. First, by evidence obtained from both man and animals that the elements of body-build are much influenced both by genes and by hormones. Second, by the fact that in large measure individual differences are of the same type as those which constitute racial difference. Of course the whole modern concept of body-mind most readily adjusts to that same conclusion.

[3] Sheldon, W. H. and S. S. Stevens. *The Varieties of Temperament, a Psychology of Constitutional Differences.* Harper and Bros., New York and London, 1942.

Tests made on animals supply some facts of much importance to this topic. In dwarf mice a single, mendelian recessive gene determines the stoppage of bodily growth at about the seventeenth day after birth, the absence of certain cells in its anterior pituitary gland (and absence of the hormones produced by these cells), with consequent inadequate development of thyroids, adrenals and gonads, and relatively quiet and inactive individuals. Stockard made crosses of several existing breeds of dogs and could show that there the type of heritable endocrine constitution was an important morphogenic and emotional influence.

In a book published a few weeks ago are described the results of my own 24-year study of the relation of endocrines to constitution in doves and pigeons.[4] From twenty-four pairs selected from a large population of doves, mongrelized comparably with the inhabitants of a typical American City, it was possible by continued selection and inbreeding to establish several strains, breeds or races on the basis of heritable endocrine difference. In these tests a series of individual endocrine inequalities, carried in a general population, were not only shown to be inherited but they were utilized to form new types, breeds or races. Though the traits "selected for" did not directly include any mental traits these latter were almost certainly sometimes involved; this follows because several hormones are known markedly to affect levels of emotion and activity, and because in some cases the levels of bodily structure or response were so unlike as to make an impress on the body-mind highly probable. Moreover some direct evidence for an involvement of behavior patterns was obtained. The established races had, among others, the following

[4] Riddle, Oscar. Publication No. 572, *Carnegie Institution of Washington*, 1947.

traits: With or without sex difference in body weight; small or large thyroid glands; long or short intestines; high or low tissue response to the hormone, prolactin; early or late sexual maturity in females; larger or smaller testis size in males; and a high or a low rate of basal and standard heat production.

In conclusion, we must recognize that essentially similar laws of inheritance, and quite comparable types of endocrine action, exist in man, mouse, dog and pigeon. And the several results reviewed above leave no doubt that genes and hormones markedly influence human mentality and behavior. By way of qualification, however, it is notable that time and (or) rate of hormone production is everywhere (animal and human) markedly influenced by the environment, and that human behavior is uniquely influenced by man's social environment. Again, whether we deal with individuals, sexes, or races we find constitutional (genic and hormonal) inequalities effective in both physical and mental spheres. It seems somewhat surprising that this evident trend of advancing knowledge has been so haltingly assigned to *racial* characteristics in recent years. No doubt the absurd Nazi doctrine of Nordic superiority, and fear of adverse effects on the social and political relations of races, have had an influence. Such hesitation, however, seems meaningless and futile, and a poor service to either the advancement or the dissemination of biological science. The observed biological inequalities are measured in biological terms, not in terms of "superiority" and "inferiority"; it would be contrary to our knowledge of gene populations, and a most astounding presumption, to infer that any one race would happen to have high frequencies of all the "desirable" genes and another race have high frequencies of all the "undesirable" genes; again, this biological or genic inequality applies to the sons and daughters of the same family in much the same way that it applies to races. One of the very greatest intellectual gifts of biology to man is precisely this assurance that all men are created biologically unequal. Some items of the evidence that this inequality includes the mentality of men have been reviewed here. Apart from the principle of genetic inequality it seems not possible to treat the varied aspects of human behavior as products of organic evolution.

A philosopher (Schopenhauer) has said, "A man can do what he will but not will as he will." The disclosures of science inadequately recounted above throw some light on the forces that tend to bind us and on others that make for the grandeur of choice; and—not the least—on those extra-genetic conditions of education and self-realization which invite us to learn and serve and live to the uttermost. To man learning and striving are the breath of life, since we are on the treadmill of life and must advance or die.

OUR ADVERTISERS

Chicago Apparatus Company Inside Front Cover
W. M. Welch Scientific Company 65
Wm. C. Brown Company 66
Carolina Biological Supply Company 66
Visual Sciences 66
Ginn and Company 67
Biological Abstracts 67
Denoyer-Geppert Company 68
College Personnel Service 85
Marine Biological Laboratory 85
General Biological Supply House 86 and Inside Back Cover
J. B. Lippincott Company 86
D. Van Nostrand 87
Garlan Publications 88
Bausch and Lomb Optical Company Outside Back Cover

Patronize our advertisers
and
mention *The American Biology Teacher*
when answering advertisements

Some Uses of Animal Behavior in The Teaching of General Biology[1]

D. F. MILLER
Ohio State University, Columbus, Ohio

I wish that every biology teacher would perform the following experiment for his own sake. Take two preserved frogs, remove the ventral body wall so as to expose the internal organs and place the animals on a table on one side of the room. Take two living frogs, pith their central nervous systems, dissect them the same as the preserved specimens and place them on a table on the opposite side of the room. Tell the students that they are to examine the specimens for five minutes. Leave the

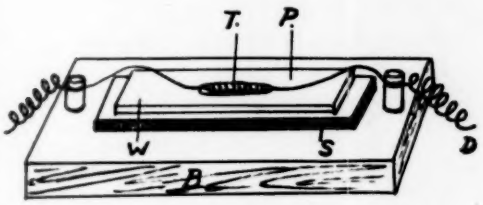


Fig. 1

Fig. 1. B, a small board with ½ inch hole in center.
S, microscope slide.
P, wax with trough T in center.
D, wires from 1½ volt dry cell.
Culture of paramecium in trough will accumulate near negative pole. *Response to galvanic current.*

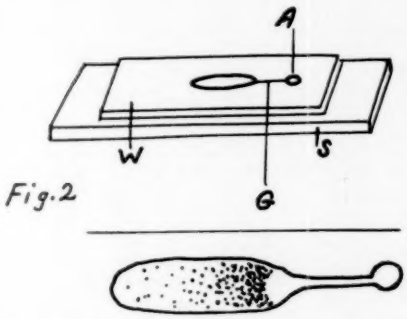


Fig. 2

Fig. 2. Similar to Fig. 1. G, groove extending to small pit A.
Weak hydrochloric acid in A will diffuse into end of trough. Paramecia will concentrate near acid area as shown in bottom view. *Response to chemical.*

[1] Abstract of an address given before the National Association of Biology Teachers at the meetings of the A.A.A.S. in Chicago, Illinois, December 30, 1947.

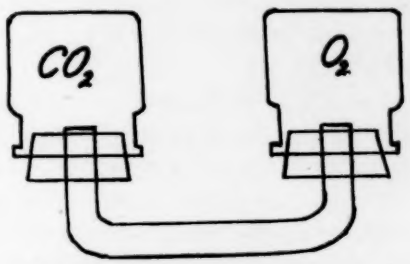


Fig. 3

Fig. 3. Two small wide-mouth bottles connected with U-tube.
Paramecia in tube will collect in end of tube connected to CO_2 bottle. *Response to chemical.*

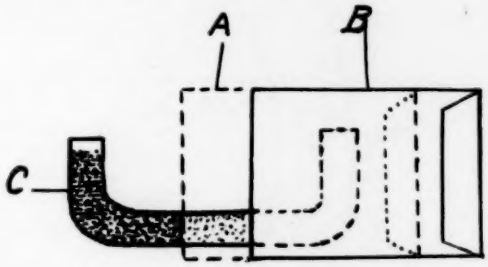


Fig. 4

Fig. 4. Same U-tube as in Fig. 3. B, black paper envelope such as is used for photographic paper.
One end of tube inserted through hole in envelope in position A. Tube C contains euglena culture. Expose to strong light then pull envelop to position B. Euglena will be concentrated in lighted end. *Reaction to light.*

room and then return at the end of five minutes. Where do you suppose the class will be? If any students are around the dead frogs it will be because they couldn't get close enough to the living frogs to see anything.

Why do they make this distinction? Because they like to see how a living thing works. They are fascinated by that little thumping mass of muscle called the heart; they may even notice that the intestines seem to slowly creep or crawl. To the youngster, at least, life is action, a vibrant thing, a going somewhere, a doing something. The study of animal structures is an interesting subject in itself, but must they be dead structures?

As an aid to interested (and interesting) biology teachers in devising behavior problems to present to their classes, the following suggestions are offered for preparing simple demonstrations together with brief indications of the results.

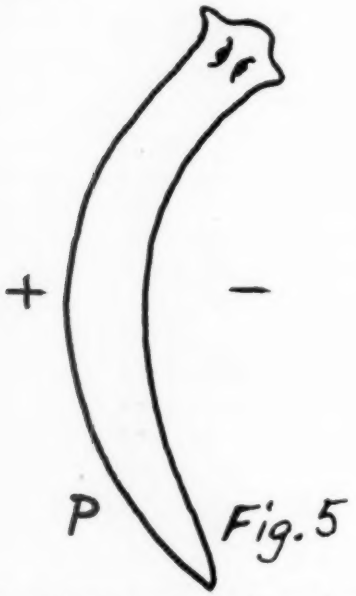


Fig. 5. Planaria on wet sheet of paper. Leads from 1½-volt dry cell are placed on opposite sides near body. Planarian bends and cannot move straight. Reversed poles give reversal of response. *Response to galvanic current.*

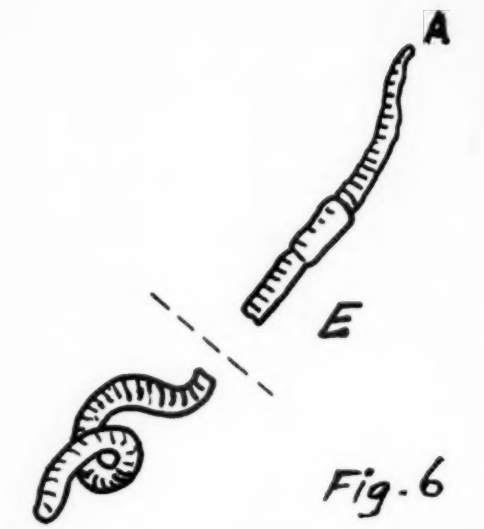


Fig. 6. Earthworm crawling on damp surface. Razor blade cuts worm into anterior and posterior halves. Anterior soon regains coordination and crawls. Posterior writhes and cannot crawl. Control by *central nervous system.*

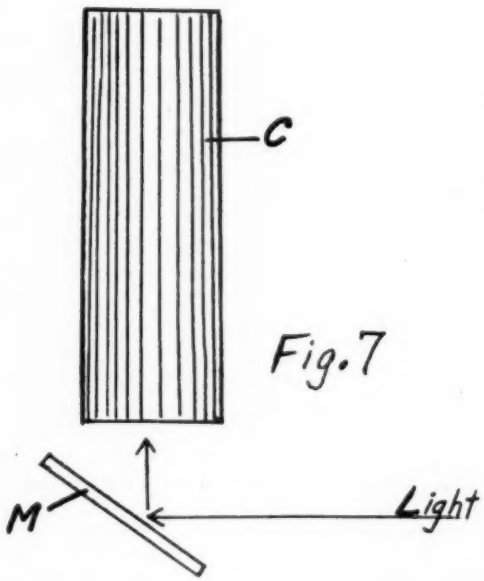


Fig. 7. C, glass cylinder covered with opaque paper or paint except on bottom, contains water and mosquito wrigglers.
M, mirror reflecting light through bottom.

Wrigglers stay toward bottom and may drown. Demonstrates *detrimental behavior.* Shows lack of purpose in behavior.

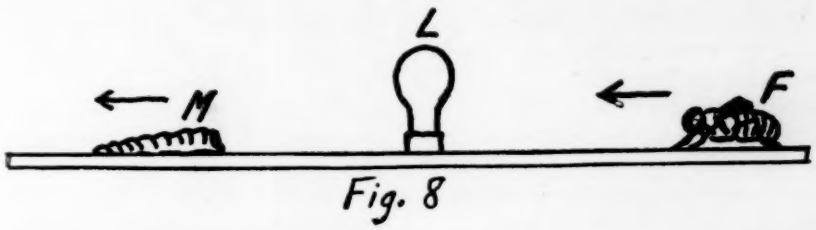


Fig. 8

Fig. 8. Blowfly maggot M kept in dark box for a while will crawl away from light L. Adult fly F with clipped wings will crawl toward light.

Demonstrates *reversal of behavior* in same animal. In maggot it results in burial or concealment. In adult it results in emergence after pupation.

Certain principles can, and should, be derived from these or similar studies. Under proper questioning they may be suggested by the students themselves. If not, they should be carefully explained. The following are examples of use.

1. *What happens when a protozoan is subjected to the influence of some environmental factor?*

It may arrange (orient) its body with respect to the source of the stimulation.

It may move in a direction toward or away from the stimulus (positive or negative).

The behavior of such an organism is the result of the interaction between the living protoplasm and the environment.

2. *What is the effect of environment upon lower many celled animals such as worms and insects?*

The effects are still mechanical and specific. The organisms behave without apparent purpose.

The central nervous system shows coordinating control over the responses in such animals.

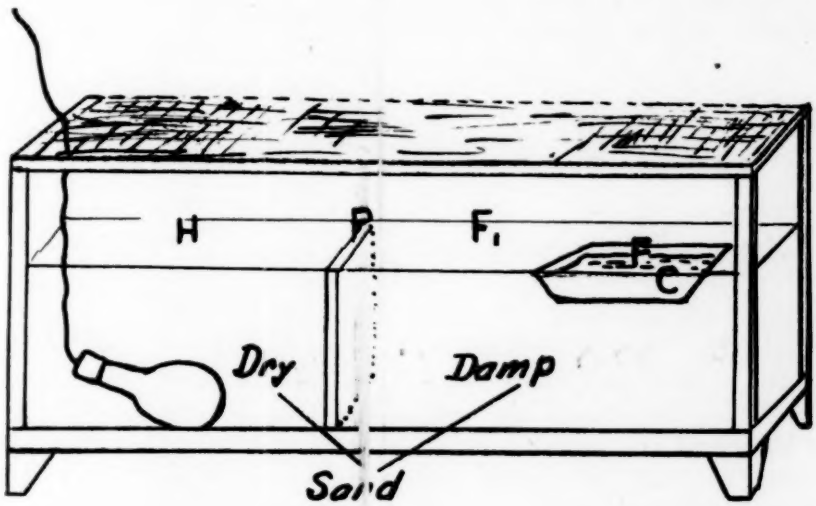


Fig. 9

Fig. 9. Aquarium, one end with hot dry sand, the other with cool wet sand. P, wood partition.

Frogs F and F_1, crayfish C, and horned toads H will distribute themselves as shown. Shows *barriers*, and relation of environment to *ecological distribution*, social relationships and populations.

3. *How do animals distribute themselves in a particular environment with respect to the conditions of that environment?*

They react either positively or negatively to the factors of their environment.

They are distributed in the environment according to the combinations of environmental conditions.

They may be killed if the conditions are too severe (limiting factors).

They may thrive and multiply if conditions are near their optimum.

They may migrate from one area to another if conditions change.

4. *How does human society compare in its behavior with the behavior of lower organisms?*

It is subject to all of the influences of environment that affect other organisms, and *social problems are simply the biological problems of man.*

Any given area of the earth will support a human population in proportion to the continued available natural resources of that area or resources made available to it from outside. This is the basis upon which large cities exist and is the essence of commerce.

Any area populated beyond its resources must depend upon outside support. Such areas are vulnerable. In such areas periodic starvation and pestilence are natural controls of population size.

5. *When overpopulated regions such as parts of Europe, China, and India continue a rate of reproduction beyond the death rate, does it solve their problem if we feel sorry for them and send our own resources to support them?*

It is obvious that this only makes possible a further increase in reproduction and enlarges the problem. It is likewise obvious that the only scientific solution involves the conscious control of population size and the conservation of essential resources.

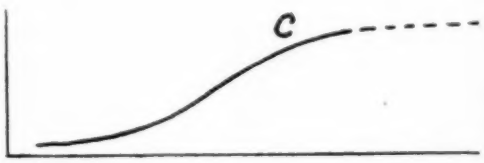


Fig. 10

Fig. 10. *Population of a single species* in a given environment shown by S-shaped curve. Slow increase, then rapid increase, then leveling off to plateau. Type of curve found in human populations shows relations to reproductive rate, death rate, natural resources of their environment.

A Review Field Activity on Plants

ELMO N. STEVENSON

President, Southern Oregon College of Education, Ashland, Oregon

The biology class had spent two weeks on the unit "The Trees and Shrubs on Our Campus." The members were well acquainted with the names, lore and natural history of the common plants about them. The instructor devised the field activity procedure suggested herein as a review and check on student learning.

Four table groups, each consisting of five or six students, made a scavenger hunt list of 20 requests for different types of leaves, fruit, bark and other objects, and knowledge concerning the campus plants. After each request there was a blank space into which the the name most appropriate to the description was to be written. The lists were interchanged between table groups. Each was to collect the objects on its list and report back to a central meeting place within a time limit of twenty-five minutes. Since each list was different, each table group went a different way.

One of the lists follows and is illustrative of the other three:

SCAVENGER HUNT LIST
(Find, collect, and name the plant)

1. A parallel veined, bi-lobed leaf _____
2. Largest leaf that you may pull _____
3. A flower of Escalonia Montevidenis _____
4. Toughest leaf found on campus _____
5. Berry that grows in an umble _____
6. A compound leaf _____
7. Small piece of fibrous red bark _____
8. Piece of bark used for medicinal purposes _____
9. Pine needles in bunches of three _____
10. A cone over six inches long _____
11. Leaf from the first tree named on the Pacific coast _____
12. Leaf used as a condiment _____
13. Leaf from tree that has at least three common names _____
14. What every girl wants to be (leaf) _____
15. Cone that hangs downward _____
16. An ubiquitous flower _____
17. Barb from a tree with a thorn one inch or more in length _____
18. Leaf of a tree important to the hosiery industry _____
19. Leaves from two trees having animals in their titles _____
20. Leaves of three plants named for countries outside of Europe _____

After the groups had found the specimens requested, they reconvened. Each checked its list and objects in the presence of the rest of the class. The group arriving first with the greatest number of right objects and responses was declared the winner.

Then the objects of the hunt were placed on the ground in a pile. The students were divided into two teams. Each team was numbered off consecutively, and was lined up parallel to and facing each other with the pile of objects between them and at least 25 feet away. A student leader called the name of one of the objects, or indicated by a statement the nature of the object. Then he shouted a number. The players with that number rushed to the pile to find the object indicated. The player getting the object first and returning back to his line, without being tagged by the opposing player, made a point for his side. If the opponent tagged the player with the object before he got back to his safety line, the opposing side received the credit. This is an adaptation of the game called "Snatch the Bacon."

Two simple games were modified and used to provide a review and evaluation exercise. The list of requests in the "Scavenger Hunt" was intriguing, in-

volved recall, and led to considerable thinking. Organization of knowledge and of group members was required. Competition within and between groups was a motivating factor. Review under such circumstances proved interesting, was conducive to both direct and concomitant learnings and enabled the teacher to evaluate the progress of his students and the effectiveness of his instruction.

BY THE WAY

FISHES from a running water environment cannot usually be kept successfully in an aquarium, unless there is equipment for keeping the water circulating. Aeration is ordinarily not adequate provision for these species. When collecting fishes for an aquarium use, specimens should be selected from still pools or the quiet parts of streams, not from riffles or swiftly running water.

VALLISNERIA (eel-grass), *Anacharis* (*Elodea*) and the like will not grow in an aquarium unless there is adequate light. There must be some direct light; if a north window is used the aquarium should be so located as to receive light most of the day, if a south window, then some provision should be made for partial shading. Direct sunlight should strike the aquarium only an hour or two a day.

SALAMANDERS, burrowing lizards, and other animals collected from under rocks and logs or from burrows can be kept in captivity only if a hiding place is furnished them.

IF YOUR SCHOOL BUDGET cannot provide for a standard laboratory autoclave, perhaps it can be stretched to include an ordinary kitchen type pressure cooker; for most purposes it will provide entirely adequate sterilization.

A DOUBLE-TUBE FLUORESCENT desk lamp not only makes a very satisfactory light for a laboratory table for dissection, etc., but also an unusually good source for the microscope.

IN MAKING MUSEUM LABELS or other cards to be left exposed to light, be sure to select a good grade of paper that will not turn yellow in a short time. A local bookstore or printshop can advise as to the best types of paper. India ink or some other form of carbon ink should be used to avoid fading.

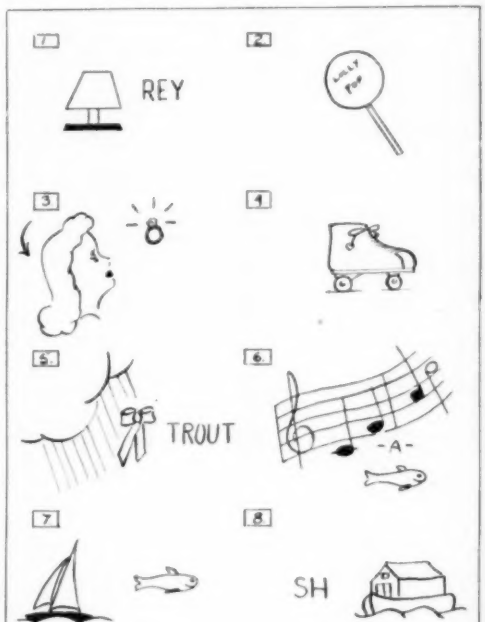
LETTERS

Dear Editor:

We realize how important it is to gain the interest of our students. Here is a game I use for that purpose. It is used to introduce studies on fish. The students have always liked it and thought it more fun to make up their own—for other groups of animals. Birds and snakes are easy to figure out.

Yours truly,

VERNA M. WEEMAN,
Albany Senior High School,
Albany, Oregon



Key to fish puzzle: 1. lamprey, 2. sucker, 3. herring, 4. skate, 5. rainbow trout, 6. tuna fish, 7. sailfish, 8. shark.

1848-1948*

This year the D. Van Nostrand Company, Inc., of New York, begins its second century of publishing. In its first hundred years the firm has contributed heavily to the spread of technological information in America and the world at large. Today Von Nostrand is issuing books for high schools, vocational schools

and college students; books for craftsmen and sportsmen; studies in social science; books for laymen interested in science; books for the home.

Early in the 1850's the firm's first office was a gathering place for engineers, scientists, and military men who came to browse through the large collection of books in the scientific and military fields Discovery of the resources of the West was reflected in a series of books on minerals of the Southwest and Pacific Coast. In the same period the first Van Nostrand textbooks appeared.

During the war years of the 60's Van Nostrand became the official publisher of military texts for the U. S. Government. In the period of industrial development after the war the Van Nostrand Science Series was started. Many volumes in this series were pioneers in their fields. The list totalled 127 titles when the last one was published in 1900. Van Nostrand has never lost its pioneering spirit and throughout the present century the firm has brought out "firsts" in various science fields.

The one-man business of a hundred years ago now requires many departments—there is a Trade Department, a Mail-Order Department, a Foreign Department, a College Department, and High School and Vocational School Department.

* A condensation of a much longer article appearing in a recent issue of *Publisher's Weekly*. Readers of *The American Biology Teacher* are of course familiar with this publisher, for the firm has produced many biological text and other books. Congratulations, Van Nostrand, on a highly successful first century and best wishes for an equally good second one.

Books

STARR, CHESTER K. *Nature and Prevention of Plant Diseases.* 2nd ed. The Blakiston Company, Philadelphia. xi + 525 pp. illus. 1947.

This book was designed particularly for the use of students whose formal training in plant pathology is limited to a single semester or year, and whose practical interest in the subject is a desire to know how to recognize, understand, and prevent plant diseases, and to whom the elementary course in plant pathology is a necessary part of the background for useful work in agriculture. The leading diseases of the major crops grown extensively in the United States, with emphasis on the recognition and the generally approved methods of their control, is given prominent attention without losing the principles underlying the science of plant pathology. Enough of the basic principles are given for an understanding of the behavior of plant pathogens and the results of their activities and to enable the student to adapt his basic training to new plant disease situations with which he may be faced.

One is impressed by the wealth of clear cut practical illustrations, logical presentation and ease of reading. This book could be well used in a high school or college Agriculture class or as a supplement to the Thallophytes in most college Botany classes. An excellent reference book for libraries.

CHARLES C. HERBST,
Beverly Hills High School,
Beverly Hills, California

DANN, W. J., SATTERFIELD, G. HOWARD, and CATTELL, JAQUES. *Biological Symposia, Vol. XII.* The Jaques Cattell Press, Lancaster, Pa. 1947. $6.50.

This volume is composed of individual contributions of original researchers in vitamin chemistry and physiology. The authors are experienced in their fields. They present their studies clearly and precisely.

The early vitamin investigators were hampered by laborious, sometimes inaccurate, and expensive animal bioassay methods. An estimation of vitamin activity in a substance was thus more comparative than quantitative. In 1919 Roger Williams developed his microbiological vitamin assay method for studying the effects of the B vitamin group on growth of yeast cells. Due to greater speed and accuracy than former methods, his assay has gained widespread use.

The medical profession as well as chemical investigators have felt the need for exact methods for quick determinations of blood vitamin levels in the human body. *Biological Symposia* presents several such methods. While advanced rickets and scurvy yield to bone x-ray diagnosis, the sub-clinical cases must be discovered by blood-level studies if early treatment and cure is to be achieved. It is to be pointed out that animal assay and microbiological methods still hold useful places in vitamin studies. By these methods the estimation of total Vitamin A activity of all compounds in a mixture possessing Vitamin A activity is accomplished.

This volume presents methods for quantitative analysis of Vitamin A, Thiamin, Riboflavin, Nicotinic Acid, Vitamin B_6, Pantothenic Acid, Biotin, Vitamin M group, Choline, Ascorbic Acid, Vitamin D, and Vitamins E and K. The high school biology teacher will find little of value here, but those interested in vitamin research will welcome it.

William A. Betts, M.D.
1016 E. 44
Austin, Texas

CONSERVATION COURSE

Establishment of a major sequence in conservation by the College of Arts and Science at Lehigh University has been announced by Philip M. Palmer, dean. Classes in this new undergraduate arts-science curriculum begin this spring.

The scope of the new program, as defined by a faculty committee developing the major sequence for the past two years, is to provide a well-rounded undergraduate training in the economic, social, and scientific aspects of natural resources. There will be no specialization; students will be expected to specialize on the job or in graduate schools. The four-year course will be devoted to basic studies leading to an understanding of conservation in all fields.

The new curriculum will be offered jointly by the departments of biology and geology. Among the required courses will be English composition, American literature, foreign languages, mathematics, philosophy, physics, religion, chemistry, fine arts, music, cartography, meterology, and climatology. Practical field trips and summer employment between junior and senior years are contemplated. Every two weeks, a two-hour seminar will be held; national conservation leaders to be guest speakers occasionally.

Biological Briefs

"We Certainly Need a Sound Philosophy." *The Living Wilderness,* 12: 1–5. Winter, 1947–48.

Frederick S. Baker, Professor of Forestry at the University of California and Howard Zahniser, Executive Secretary of the Wilderness Society, Washington 9, D. C., exchanged a series of letters, published under the above title, in which they candidly discuss views with regard to the dedication of wildernesses in perpetuity. The views are condensed into a series of pro and con statements, given alternatingly.

The maintenance of areas of primitive America where there will be only primitive transportation and habitation, represent a "narrow-minded viewpoint of the elite in pocketbook or physical stamina." It is asking too much "to subscribe to the proposition that lands of outstanding scenic or recreational value should be reserved as wildernesses, withheld from general use for the uplift of such souls as can use them." On the other hand the admission of such things as roads, mechanical vehicles, and buildings which would bring in greater numbers of people mean that "the wilderness would no longer be there—for anyone." A wilderness experience is something "to which every American is entitled, including those that are not yet born."

Still again the reasons for seeking lonely places may not be particularly noble ones. The solitary minded may be "misfits in a social world." The adventurous man-against-nature fellows, though harmless, are rather narrowly centered on themselves; there is nothing altruistic involved. "There is the ancient breed of adventurers who go in search of the strange and unusual and gloat over the things they have seen."

Once in the woods, however, these solitary minded adventurers may "experience a better understanding of themselves in relation to the whole community of life on earth and rather earnestly compare their civilized living with natural realities—to the improvement of their civilization."

"The searcher after the strange can find it everywhere if he opens his eyes." The trouble with the primitive camper is that he does not want to do that; "he wants the strange to pass in review before him." Actually "the wilderness is a matter of mind more than virgin acres."

Perpetuating this "within-us" idea "is itself dependent on the perpetuation of the wilderness . . . for values that will not be fully realized until many years from now."

F. S. Baker states: "I am a forester and as such am wedded to the belief in the use of our natural resources for necessary economic purposes. . . ." There is no doubt but the wilderness areas must give in little by little. "People must live and have bread and houses before Shangri-la. . . . The Wilderness Society (however) performs an important function in slowing down and frustrating poorly conceived projects."

Howard Zahniser comments: "We believe the United States can have its wilderness areas and its outdoor recreation with convenience—both. We want the wilderness saved for those who want the kind of outdoor recreation that can be obtained only in such areas . . ." and for its research and historical values.

ROBERT C. MCCAFFERTY,
Central High School,
Wadsworth, Ohio

NELSON, BETTY MASSINGALE. Tree-Rings Tell a Story. *Nature Magazine,* Vol. 47, p. 65–68, February, 1948.

A new kind of calendar has been developed in the Southwest; it is *Dendrochronology,* or the science of tree-ring timing. It has been known for centuries that the age of trees can be determined by their "rings" and Leonardo da Vinci noted the differences between rings formed in dry years and in wet years. Among the most valuable applications of modern tree-ring science has been to archeology. By cross-dating wood cut from trees of different ages definite dates have been assigned to various pueblo dwellings of the early inhabitants of Arizona and other western states. For a long time there was an undetermined gap in the chronologies, so that the tree-ring calendar stopped just before the year 1300. The confusion was due to a tremendous drouth that extended over a twenty year period from 1276 to 1299. The calendar now dates back to 11 A.D. in northern Arizona and to 1306 B.C. in the giant sequoias of California. The most severe drouth recorded was the one noted above, the next worst in 1573 to 1593 and the third in magnitude from 1894 to 1904; this suggests a 300-year cycle. However, in the period about 1000 the rings show only a period of below average rainfall.

Another important application of this science is to hydrology. It has been possible by comparing tree rings over wide areas to arrive at an estimate of the run-off of rainfall in the Colorado river basin from about the 13th century up to the present time. Such information can be used by hydrologists in their studies of the amounts of water that may be expected to drain into a large basin such as Lake Mead for a given period projected into the future.

"In the tree-ring laboratory at the university (of Arizona), Dr. Douglass and his staff are surrounded by various pieces of wood that look as though they had been cut only yesterday. It is startling to realize that many of these pieces are hundreds, even thousands, of years old, and that many of them were cut with stone axes for roof beams. One interesting fact was that one of those beams from the ruins of pre-historic dwellings was used when Dr. Douglass was called to testify in a law-suit challenging the durability and strength of Arizona pine as lumber."

ROMANIAK, THEODORE H. Preparing and Embedding Spalteholz Type Preparations in Bio-Plastic. *Ward's Natural Science Bulletin,* XXI: 38, January, 1948.

Biology teachers interested in the embedding of specimens in plastics should read this

article, which presents in brief form the various steps involved, namely fixation and preparation, cartilage staining, maceration, bone staining, dehydration, clearing and impregnating, embedding. Under each heading the article gives the chemicals used and the times involved. For example: "BONE STAINING—After maceration, the specimens are transferred to a staining solution, using 1 part Alizarin Red S to 10,000 parts of 1% KOH. The time for staining varies, depending on the density desired; the longer the staining period the deeper the color. If the tissue shows traces of stain, it may be put in a 1% KOH solution where it will be destained. Excessive absorption of stain in the soft tissue indicates improper maceration."

JOHN BREUKELMAN

Commercials

Readers of *Ward's Natural Science Bulletin* have noted with interest the improved "new look" of this little journal in the past few months. The modern dress consists of a more readable type, more appealing arrangement of illustrations and improved arrangement. Readers of *The American Biology Teacher* who have noted Ward's advertisements and have not been receiving the Natural Science Bulletin should address Ward's Natural Science Establishment, Inc., 3000 Ridge Road East, Rochester 9, New York. The *Bulletin* is sent free of charge to all teachers who desire it. Together with informational advertising of the products of Ward's the publication includes articles of items of biological interest, letters, news items, etc.

THE JAM HANDY ORGANIZATION is now exclusive distributor for *Curriculum Films* in the United States and Canada. Under the new distribution plan the two organizations will be able to expand their visual aids program for schools, and to make more color films available. Curriculum Films has conducted extensive research to determine the fields in which educational films are needed and has followed through with the development of new film subjects planned under the guidance of teaching authorities. Curriculum slidefilms now being distributed do not include series on biology, but additional films are being prepared. For complete information write to The Jam Handy Organization, 2821 East Grand Boulevard, Detroit 11, Michigan.

TWO NEW COLOR Teach-O-Slide sets on "Primary Arithmetic" and "North American Game Birds and Animals" have been released by the Audio-Visual Division of *Popular Science Publishing Company*, 353 Fourth Avenue, New York 10, N. Y. These new visual teaching aids further the company's policy of providing units for use within regular school curricula.

The "North American Game Set" is made up from *Outdoor Life* Magazine's "Gallery of North American Game," consisting of paintings by Francis Lee Jaques, for 20 years staff artist at the American Museum of Natural History. The 31 kodachrome slides, one of which is shown in the accompanying illustration, are admirably suited for elementary and junior high school classes in Biology Nature Study, General Science and Geography. The price of the North American Game slide set is $15.50. Further information may be obtained from the Audio-Visual Division of Popular Science.